# SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED.

## Synopsis for Proposed Research Plan

**"Studies on *Goniocaulon indicum* (Klein ex Willd.), a wild vegetable of Family Asteraceae."**

**Submitted for the degree of**

**Doctor of Philosophy in Botany**

**Under**

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**Submitted**

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**Research Title:**

# "Studies on *Goniocaulon indicum* (Klein ex Willd.), a wild vegetable of Family Asteraceae."

## 1. Introduction:

Wild vegetables have been used worldwide for decades as part of the human diet. Edible herbal medicines that have therapeutic value may go a long way in deriving drugs from these wild vegetables, whose plant parts can be easily harvested continuously. Therefore, there is a need to evaluate edible wild herbs for their therapeutic values (Maroyi et al., 2011) that may benefit the community. The current study aims to thoroughly investigate the selected species for its morphology, anatomy, histology, pharmacognosy etc. Examine their antimicrobial and anticancer activities if any. The use of traditional medicine is not new; it gained incredible popularity in the 1990s (FAO, 1997). Other studies in Ethiopia have shown that many tribal communities have received extensive information about the use of wild vegetable resources, particularly regarding the use of medicinal plants (D. Abebe and A. Anteneh, 1993). Several phytochemicals present in wild herbs are promising options for improving the effectiveness of cancer treatment. Most of these phytochemicals are naturally occurring biologically active compounds with excellent anticancer properties. The development of effective therapeutic and adverse effects of phytochemical-based antimicrobial and anticancer therapy begins with the testing of natural extracts (from dried plant extracts) to detect potential antimicrobial and anticancer activity. The nutrients found in plants, known as phytochemicals, can act as important resources in developing new medicines.

There are many wild herbs, collected from nature and widely used as vegetable all around the world, but understanding their therapeutic properties, safety, and effectiveness has become a major problem in recent years (Sekeroglu and Koca, 2010). The increase in the prevalence of common pathogenic microorganisms that are resistant to wide variety of antibiotics over the years necessitates new antimicrobial agents. Wild herbs offer new antimicrobial agents and a large number of new drug components (Nascimento et al., 2000; Obeidat et al., 2012). Wildly harvested vegetables have fewer side effects compared to synthetic or semi-synthetic drug agents. A large number of plants have been screened to identify potent antimicrobial agents every year (Obeidat et al., 2012; Molla et al., 2010).

The plant selected for the present study is highly ignored even its occurrence is common and fairly used by local peoples as wild vegetable in its early growth stage. While a literature survey we rarely found any research article on this plant.

Cancer is a major public health problem worldwide. According to the World Health Organization (WHO) in 2021, cancer is the first or second leading cause of death before the age of 70 in 112 out of 183 countries and is ranked third or fourth in 23 countries. Globally, an estimated 19.3 million new cancer cases and nearly 10.0 million cancer deaths occurred by 2020 (Hyuna Sung, 2020). In 2020, the diagnosis and treatment of cancer were disrupted by the coronavirus (COVID-19) epidemic, leading to delays in diagnosis and treatment that could result in a temporary decrease in cancer cases followed by an eventual increase in prevalence and mortality (Rebecca L. et al., 2021). The global cancer burden is projected to reach 28.4 million cases by 2040 due to demographic changes, potentially linked to increased risk factors related to global trade and economic growth (Hyuna Sung et al., 2020). The burden of cancer and mortality is rapidly growing around the world; in rural areas, cancer is becoming an epidemic (Susan J. Curry et al., 2003).

## 2. Review of literature and development in the subject (Previous work done in a relevant area):

The consumption of wild greens has traditionally played an important role in complementing staple agricultural foods in many countries, and their contribution to the Mediterranean diet is welldocumented (Hadjichambis et al., 2008; Leonti et al., 2006; Tardı´o, 2010). Several studies reveal the significant role played by unconventional species as excellent sources of macro- and micronutrients, contributing to human dietary requirements (Flyman and Afolayan, 2006; Grivetti and Ogle, 2000; Ogle, 2001). Moreover, green leafy vegetables may have a role as functional foods, as they contain physiologically active food components and provide health benefits beyond basic nutrition. They show potential biological activity of interest for preventing several chronic diseases (Guil-Guerrero et al., 1998a, b; Flyman and Afolayan, 2006). Therefore, the revalorization of these traditionally consumed wild species is an important strategy to improve the diversity of available foods, which is currently receiving renewed attention.

The Asteraceae is one of the largest plant families, with more than 1600 genera and about 23,000 species, most of which occur in temperate regions (Jeffrey, 2007). These plants are generally herbaceous and less frequently shrubs or sub-shrubs (Punt and Hoen, 2009). Human consumption of wild edible members of the Asteraceae family has been widespread; for example, out of the 719 Asteraceae species in the Iberian flora, 65 species have been used as wild vegetables in Spain. Regression analysis showed that the number of edible species used is much higher than predicted by the number of species in this family (Tardı´o, 2010). This preference for Asteraceae vegetables is certainly due to their agreeable sensory properties, leading to the cultivation of many species of this family for human consumption (Guil-Guerrero et al., 1998a).

There are various ethno botanical references from Spain (Tardı´o et al., 2010) and other countries (Hadjichambis et al., 2008; Leonti et al., 2006) confirming that the leaves of many Asteraceae are

traditionally consumed – either raw or cooked – in the regions where they grow. Some of these references suggest that they may provide a significant input of biologically active compounds in the diet (Leonti et al., 2006). However, these wild plants have been little studied as foods and are not included in food composition databases due to the scarcity of data on their composition in the scientific literature.

In India, edible wild vegetables have been identified as an important resource for the social and economic well-being of communities. In 2019, Hanumantappa Bherigi Nayaka reported fifteen wild herbs with medicinal value consumed by the Hyderabad-Karnataka region in the Karnataka region of India. He reported that wild herbs are used to treat high blood pressure and diabetes.

## 3. Objectives of the Research/Proposed Hypothesis:

- Collect, identify, and validate selected plant on the basis of morphological and anatomical studies.
- Conduct a pharmacognostic study of selected plant.
- Evaluate the chemical composition of wild vegetables.
- Screening for phytochemicals.
- Conduct antioxidant potential and antimicrobial assays.
- Characterize phytochemicals using techniques such as HP-TLC, GC-MS, HR-LCMS, or other selected methods.
- Test the anticancer activity using the SRB/MTT assay.

## 4. Methodology to be adopted:

**Phase-I: Literature survey, collection/authentification/identification of a wild vegetable:**

Our primary focus is on a literature survey to know about the plant. In-depth information was collected about the wild vegetable from traditional healers of the Nanded district with extensive field visits. A wild vegetable to be collected from the study area and identify by using the flora of the Marathwada region (Naik V. N, 1998) and all other possible resources.

**Phase-II: Preparation and Extraction of plant samples:**

The collected plant parts (Root, Stem and Leaves) will be shade dried for after which it is to be powdered using, the dried samples (plant powder) were kept in tight bottles. The Soxhlet extraction unit will be used for the ethanolic extract of plant powders (Harborne J. B., 1973).

**Phase III: Phytochemical analysis extracts for quality and quantity:**

Phytochemical testing will be performed on the ethanolic plant extraction using the normal process of identifying phytoconstituents as described by Trease and Evans (1989) and Kankia H.I. (2014). **Phenolic content ratio:** Estimation of polyphenolic content from selected plants will be determined by previously reported methods (Bray and Thorpe, 1954). The phenolic compound reacts with the

oxidizing agent phosphomolybdate present in the Folin-Ciocalteau reagent, the resulting reaction product being a complex blue color with a high dispersion of 660 nm. Briefly, the reaction mixture contains 1 ml extracted from each plant sample, 2 ml of distilled water, 0.5 ml of Folin-Ciocalteau reagent, and 2 ml of Na2CO3 (20%). The mixture will be stored in a water bath for 1 minute and after cooling, the absorption will be measured at 660 nm in the correct position using a UV-VIS spectrophotometer. The total amount of polyphenols will be calculated by adjusting the measuring curve using a different mixture of rutin (500 lg / ml) and an unknown amount of phenolics measured as mg / g of samples (R.N. Gacche, N.A. Dhole, 2011).

**Flavonoid content ratio:** The total flavonoid content of each plant sample is measured using the aluminum chloride method, as described by Chang et al. in 2002. The reaction mixture consists of 1 ml of the plant sample, 3 ml of methanol, 0.2 ml of 10% aluminum chloride, 0.2 ml of 1 M potassium acetate, and 5.6 ml of distilled water. The mixture is left at room temperature for 30 minutes, and the absorption is then recorded at 415 nm using a UV-VIS spectrophotometer. The standard curve is prepared using serial dilutions of quercetin (100 µg/ml). The collection of flavonoid samples for each plant is calculated using the standard curve and quercetin values (mg/g).

**Phase IV: Antimicrobial activities of certain wild vegetable extracts:**

Ethanol plant extracts will be tested against various bacterial and fungal microorganisms to assess the biological barrier tested using standard protocols.

**Phase-V: Identification of Phytochemicals from extracts by using HPTLC/GC-MS/HR-LCMS:**

The plant extracts usually contain various types of phytochemicals. Therefore, the isolation of these phytochemicals will be carried out by using separation techniques such as HPTLC/GC-MS/HRLCMS. This separation technique is carried out from an outsourcing facility available at the specific research center.

**Phase-VI: Screening and Evaluation of antimicrobial and anticancer potential of plant extract:**

The anticancer activity will be performed using a test of the yellow tetrazolium MTT (3- (4, 5dimethyl thiazolyl-2) -2, 5-diphenyltetrazolium bromide) and made into a discharge center located in a specific study area.

**Phase-VII: Thesis writing and submission:**

In the final phase, scientific thesis writing will be done and submitted to the research university.

## 5. Importance of study/society application:

**International status:**

**Biodiversity and Conservation:** Goniocaulon indicum, commonly known as Indian daisy, is a wild vegetable belonging to the Asteraceae family. The concern here would be the potential impact of overharvesting or unsustainable collection of this species for its edible parts. If not managed carefully,

such activities could lead to the depletion of wild populations, impacting local ecosystems and biodiversity.

**Nutritional Security and Food Sustainability:** If Goniocaulon indicum is being considered for broader consumption, the studies would likely assess its nutritional composition, potential health benefits, and whether it could contribute to food security, particularly in areas with limited access to diverse sources of nutrition.

**Health and Safety:** Any consideration of Goniocaulon indicum as a food source would require rigorous testing to ensure its safety for consumption. This includes assessing the presence of any toxins or anti-nutritional factors that could impact human health.

**Phytochemical Exploration:** Investigating the phytochemical composition of Goniocaulon indicum can lead to the discovery of bioactive compounds. However, this also raises concerns about how these compounds will be used, patented, and commercialized. Ethical considerations about benefit sharing, particularly with local communities, are important.

**Benefit to Society:**

If the study identifies effective anticancer compounds, the concern would be to ensure that these findings are translated into treatments that benefit society. This could involve collaborations with pharmaceutical companies, researchers, and medical professionals.

**National status:**

At present very scare and primitive type of information about the Goniocaulon indicum is available in the scientific literature. Regarding the same the present research work will initiate the work on the plant and will help in the popularization of it among the peoples as vegetable.

The screening of the plant extract is a common practice during the research in the field of plant photochemistry and pharmacy. There for the screening of the plant extracts of Goniocaulon indicum will lead to extend the same. The study plans the anticancer testing of its extracts by using the SRB/MTT assay it in concurrence with current status of cancer in India as well as all over the world. A report by the National Cancer Registry Program 2020, released by the Indian Council of Medical Research (ICMR) and the National Center for Disease Informatics & Research (NCDIR), Bengaluru, estimates that by 2020 the incidence of cancer in the country will reach 13.9 lakhs and possibly increase. at 15.7 lakhs by 2025, based on current trends. This data is based on cancer-related information collected from 28 Population-based Cancer Registries (PBCRs) and 58 Hospital Based Cancer Registries (HBCRs) that provided cancer data.

Today, there are many different types of cancer treatments, such as surgery, chemotherapy, radiation, and so on, but they may also produce side effects. Therefore, there is a need to develop novel and effective herbal drugs as well as free side effects for cancer treatment.

## 6. Proposed work Plan/ Formulation and structure of the study

| Sr. No. | Year | Proposed work | Tentative Duration |
|---|---|---|---|
| 1. | I$^{st}$ Year | Literature survey | **First Year** (Aug.23-Aug.24) |
| | | Collection/identification and authentification of a wild vegetable of Asteraceae family from the Nanded District | |
| | | Drying and Extraction of plant samples | |
| | | Screening of a wild vegetable for their chemical composition | |
| 2. | 2$^{nd}$ Year | A qualitative test of plant extracts for the presence or absence of secondary metabolites | **Second Year** (Aug.24-Aug.25) |
| | | Quantitative testing of selected plant extracts (Root/Stem/Leaf) | |
| | | Antimicrobial activity of plant extracts | |
| 3. | 3$^{rd}$ Year | Separation of Phytochemicals by using HP-TLC/GCMS/HR-LCMS. | **Third Year** (Aug.25-Aug.26) |
| | | Screening and Evaluation of certain Plant extracts from wild vegetables for their anticancer activity by using SRB/MTT Assay | |
| | | Thesis writing and submission | |
| □ Presentation and publication of research work and attending conferences will be done alongside all the activities mentioned in the above table. | | | |

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